2006 Kansas Irrigation Water Conservation Plan Guidelines



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Table of Contents

INTRODUCTION	1
Review of Statutes	
Definition of Water Conservation	
Goals for the 2006 Revised Guidelines	4
GUIDELINES FOR PREPARING A WATER CONSERVATION PLAN	4
Introduction Section	4
System Section	
Management Section	
Agreement Section	
APPENDIX A - EXAMPLE PLAN	9
APPENDIX B - DEFINITIONS	17

Introduction

The 2006 irrigation water conservation plan guidelines were prepared for use by irrigators to assist them in preparing a water conservation plan. The guidelines do <u>not</u> designate certain water users or categories of water users who must prepare water conservation plans. The Kansas Statutes provide direction in regard to which water users should be required to prepare water conservation plans.

Review of Statutes

K.S.A. 74-2608 outlines the mandatory duties of the Kansas Water Office. Subsection (c) of K.S.A. 74-2608 state one of the Kansas Water Office's three mandatory duties: "The Kansas Water office shall develop and maintain guidelines for water conservation plans and practices. Such guidelines shall:

- 1. Not prejudicially or unreasonably affect the public interest;
- 2. be technologically and economically feasible for each water user to implement;
- 3. be designed to curtail the waste of water;
- 4. consider the use of other water if the use of freshwater is not necessary;
- 5. not require curtailment in water use which will not benefit other water users or the public interest;
- 6. not result in the unreasonable deterioration of the quality of the waters of the state;
- 7. consider the reasonable needs of the water user at the time;
- 8. not conflict with the provisions of the Kansas water appropriation act and the state water planning act;
- 9. be limited to practices of water use efficiency except for drought contingency plans for municipal users; and
- 10. take into consideration drought contingency plans for municipal and industrial users."

The statute also states that: "When developing such guidelines, the Kansas water office shall consider existing guidelines of Groundwater management districts and the cost-to-benefit ratio effect to any plan."

Subsection (c) of K.S.A. 74-2622 outlines the mandatory duties of the Kansas Water Authority. Paragraph 11 of subsection (c) states that the "Kansas water authority shall approve, prior to adoption by the director of the Kansas water office, guidelines for conservation plans and practices developed pursuant to subsection (c) of K.S.A. 74-2608, and amendment thereto."

K.S.A. 82a-733, passed by the 1991 Kansas Legislature, focuses on water conservation plans and practices. Contained within Subsection (a) of K.S.A. 82a-733 is the statement that: "The chief engineer may require an applicant for a permit to appropriate water for beneficial use or the owner of a water right or permit to appropriate water for beneficial use to adopt and implement water conservation plans and practices."

Also within subsection (a) of K.S.A. 82a-733 is the following statement: "In selecting the application, water rights or permits for which conservation plans and practices are required to be adopted and implemented, the chief engineer shall give priority to: (1) Water users that share a common source of supply that could be insufficient during times of drought; (2) water users whose use is significantly higher that their peers from the same geographical area with comparable circumstances; and (3) water users who apply for any state administered grant, loan or cost-share moneys for water-related projects."

Contained within Subsection (c) of K.S.A. 82a-733 is the statement: "Plans and practices required pursuant to this section shall be consistent with the guidelines for conservation plans and practices developed and maintained by the Kansas water office pursuant to subsection (c) of K.S.A.74-2608 and amendments thereto." Subsection (c) of K.S.A. 82a-733 also contains the statement that: "The Kansas water office shall provide, or arrange to provide, technical assistance for water users required to adopt and implement conservation plans and practices pursuant to this section."

Subsection (d) of K.S.A 82a-733 states: "Before any state agency makes any loan or grant, or provides any cost-share funds, for any water-related projects to any person or entity, the state agency may require the person or entity to submit to, and have approved by, the chief engineer a water conservation plan consistent with the guidelines for conservation plans and practices developed and maintained by the Kansas water office pursuant to subsection (c) of K.S.A. 74-2608 and amendments thereto."

Subsection (f) of K.S.A 82a-733 states: "The chief engineer may approve the conservation plans and practices required pursuant to the provisions of this section on such terms, conditions and limitations as deemed necessary to carry out the provisions of this section. The implementation of the conservation plan and practices as approved or any subsequent approved modification shall constitute a condition of the water right or permit to appropriate water for beneficial use."

Subsection (g) of K.S.A 82a-733 states: "Any conservation plans and practices required pursuant to this section with regard to any groundwater right or permit to appropriate groundwater from within the boundaries of a groundwater management district shall be subject to approval by both the chief engineer and the board of directors of the groundwater management district unless such plans and practices are incorporated in the groundwater management district's management program which has been approved by the chief engineer pursuant to K.S.A. 82a-1029 and amendments thereto."

Subsection (h) of K.S.A 82a-733 states: "The chief engineer may delegate authority to implement and enforce any of the provisions of this section to a groundwater management district on such terms as may be appropriate and necessary to carry out the provisions of this section within the boundaries of such district."

Subsection (i) of K.S.A 82a-733 states: "The chief engineer may delegate to any city which has conservation plans meeting state guidelines the authority to require domestic water users within such city to adopt and implement conservation plans and practices so that such city can require compliance from private domestic well owners within the city limits."

K.S.A. 82a-1311a authorizes the Kansas Water Authority to require an applicant for a contract for the sale of water from the State's conservation water supply capacity to adopt and implement water conservation plans and practices that are consistent with the guidelines.

K.S.A. 82a-1348 states that: "Each member of a water assurance district shall adopt conservation plans and practices for such member. Such plans and practices shall be consistent with the guidelines for conservation plans and practices developed and maintained by the Kansas water office pursuant to K.S.A. 74-2608, and amendments thereto."

K.S.A. 82a-1502, which is part of the Water Transfers Act, was amended by the 1993 Legislature. Subsection (b) of K.S.A. 82a-1502 contains the statement: "No water transfer shall be approved under the provision of this act: (1) if such transfer would impair water reservation rights, vested rights, appropriation rights or prior applications for permits to appropriate water; and (2) unless the hearing officer determines that the applicant has adopted and implemented conservation plans and practices that (A) are consistent with the guidelines developed and maintained by the Kansas water office pursuant to K.S.A. 74-2608 and amendments thereto, (B) have been in effect for not less than 12 consecutive months immediately prior to the filing of the application on which the hearing is being held."

Subsection (c) of K.S.A. 82a-1502 contains the statement: "To determine whether the benefits to the state for approving the transfer outweigh the benefits to the state for not approving the transfer, the hearing officer shall consider all matter pertaining thereto, including specifically:...(7) the effectiveness of conservation plans and practices adopted and implemented by the applicant and any other entities to be supplied water by the applicant; (8) the conservation plans and practices adopted and implemented by any persons protesting or potentially affected by the proposed transfer, which plans and practices shall be consistent with the guidelines for conservation plans and practices developed and maintained by the Kansas water office pursuant to K.S.A 74-2608 and amendments thereto."

K.S.A. 82a-1608 relates to the Multipurpose Small Lakes Program and includes the statement: "If public water supply storage is included in such a project, the sponsor shall have a water conservation plan which has been submitted to and approved by the chief engineer."

K.S.A. 65-163g, passed by the Legislature in 1994, addresses the Kansas Department of Health and Environment public water supply loan program priority list considerations. Subsection (b) states that "the secretary shall: (1) Exclude from the priority list any project of a municipality which has not adopted and implemented conservation plans and practices that are consistent with the guidelines developed and maintained by the Kansas water office pursuant to K.S.A. 74-2608 and amendments thereto."

Definition of Water Conservation

It is important that the State's Irrigation Water Conservation Plan Guidelines provide a definition of water conservation that is consistent with the intent of the guidelines and is appropriate for use by all irrigators and agencies/entities that are responsible for monitoring the effectiveness of water conservation plans. The following definition has been selected. Water conservation is the utilization of cost-effective water use efficiency practices to curtail the waste of water and to ensure that water use does not exceed reasonable needs.

Goals for the 2006 Revised Guidelines

This revision of the Irrigation Water Conservation Plan Guidelines is designed to achieve the following goals:

- 1. Provide Guidelines and a Plan template that can be used to develop a water conservation plan to meet the requirements of the Division of Water Resources (DWR), the Groundwater Management Districts (GMD) and/or the Natural Resources Conservation Service (NRCS). All three agencies participated in the guidelines revision.
- 2. Provide considerable flexibility to GMDs and the DWR to develop and monitor water conservation plans based on local desires and initiatives;
- 3. Provide Internet access to the Guidelines and the Plan template, so that irrigators and consultants can easily download the template or develop a Plan online.
- 4. Include a subsection on irrigation scheduling, which is required by DWR for the Blatant and Recurring Overpumping Program.
- 5. Make the Plan more useful, so that the majority of Kansas irrigators will be more involved in their water conservation plan;
- 6. Provide for a more efficient, comprehensive and consistent irrigation water conservation plan; and
- 7. Curtail waste of water and ensure that water use does not exceed reasonable needs.

GUIDELINES FOR PREPARING A WATER CONSERVATION PLAN AS PER K.S.A. 74-2608 ET SEQ

Each Irrigation Water Conservation Plan shall contain the following four sections: (1) Introduction; (2) System; (3) Management; and (4) Agreement. An "Example Irrigation Water Conservation Plan" is presented in Appendix A to assist irrigators in preparing their plans. It should be noted that the example plan represents the typical requirements for a water right identified in the DWR Blatant and Recurring Overpumping Program and Enhanced Water Management. Specific Irrigation Water Conservation Plans may have different requirements depending on the irrigation system used and the reason for the Plan's development. Appendix B is a glossary of selected water use efficiency practices and other terms used in this publication.

Introduction Section

The Introduction Section of each plan shall include the name and contact information of the irrigator responsible for preparing and implementing the plan; the name and contact information of the owner of the water right; and a brief description of the reason for developing the water conservation plan. The introduction will also include water right information: DWR file number; the county and legal description of the point(s) of diversion; the source of the diversion (ground or surface); the number of acre-feet authorized; and the authorized rate of diversion. For each field to be irrigated the following information should be provided: the number of acre-feet authorized for irrigation; the number of acres planned for irrigation; and the legal description of the field.

System Section

The System Section of each plan shall include specific information on proposed or current: metering device(s); field conditions; water source and conveyance; and the irrigation system. This information is needed to ensure that the system will be able to adequately irrigate the field(s) and stay within the authorized quantity and rate of diversion. Forms may be available from NRCS that could be used to satisfy the requirements in this section.

Meter Information

Metering of water use is an important management tool for irrigators. It is also necessary to meter water use in order to adequately monitor and evaluate the effectiveness of individual water conservation plans. Consequently, the installation, maintenance and reporting of information on water meters is a requirement for all water conservation plans.

A water meter or other measuring device must be properly installed and maintained in accordance with specifications and standards established by the DWR in conjunction with the appropriate Groundwater Management District. The water user must comply with any applicable meter standards, regulations and other requirements established by an appropriate regulatory agency.

If the water conservation plan is being prepared for an existing DWR water right file number that has a water meter, information should be provided in regard to: the installation date; manufacturer; type of meter; size of meter (in inches); unit of measurement (acre-feet, gallons, etc.); multiplication factor (if any); location; and inside diameter of the pipe. Additional information may also be included, such as the model number and serial number of the meter, if available, and the outside diameter of the pipe (required by GMD 4).

If the water conservation plan is being developed for a new or existing DWR water right file number that **does not** have a water meter, then in this section of the plan the irrigator should state that:

A water meter will be purchased and installed in accordance with Division of Water Resources (or Groundwater Management District) procedure as of a certain date and appropriate information about the meter will be provided to the Division of Water Resources and/or the Groundwater Management District (which ever is the appropriate entity).

Field Information

Soil type and design slope are required information. Completion of a soil/slope worksheet or other conservation plan map may be required by NRCS or DWR. Soils maps and tables are needed to complete the soil/slope worksheet and should be available at county conservation district or NRCS offices.

Source and Conveyance

The results of an evaluation of the well and/or pump site; and a description of the conveyance system may be required, if applicable.

Irrigation System Information

The type of information required for the current and/or proposed irrigation system is system dependent (sprinkler, flood, or drip system). Sprinkler systems (center pivot, side-roll, traveling gun, hand-moved, tow-lines or solid set) require information on: system type; the manufacturer; system length; design discharge rate; design pressure; pressure regulators (if installed); nozzle package type; nozzle height from the ground; nozzle spacing; acres in field; maximum wetted diameter; and end gun (if installed on a center pivot). The results of a system design may also be required.

Flood systems (gated pipe, siphon tubes, borders, bench terrace, furrow diking, or other) require information on: the type of system; run length; design discharge rate (gpm); acres in field; surge valves (if applicable); and a description of the tailwater recovery system. A system design may also be required.

Drip systems require information on: above or below ground installation; design flow; acres in field; tape installation depth (for sub-surface systems); tape diameter; tape spacing; planting orientation; and maximum run length. A system design and evaluation may also be required.

Management Section

The Management Section of each plan shall include information on meter maintenance and compliance. It will also address other management issues, such as irrigation scheduling and irrigation system-specific information on application depth, set times, and application method. All plans are required to include information on cultural and tillage practices; a crops and operations plan is also needed. This section of the water conservation plan should address runoff control and how the irrigator proposes to ensure that irrigation water does not leave the proposed or authorized place of use. The information provided in this section, in conjunction with the information provided in the System Section, should demonstrate that the physical irrigation system(s) and management practices are appropriate for the place of use.

Metering

There are a variety of methods to measure irrigation water usage. Since most irrigation water usage in Kansas is supplied by wells that deliver water to the irrigation distribution system via a closed pipeline, the most common method of measurement is the use of an in-line water meter. Most water meters are propeller-type water meters. All points of diversion under a water conservation plan are required to have a water meter.

Water measurement is important to irrigators for several reasons. The first is that water measurement can provide the basis for evaluations to optimize irrigation applications. Implementation of best management practices is much more difficult without some means of water measurement. Water measurements can also help determine overall irrigation system efficiency, monitor system performance, detect well problems, monitor pumping plant performance, and simplify the completion of the annual water use report.

In this subsection, the irrigator acknowledges the requirements for installing and maintaining a water meter under DWR and applicable GMD regulations. This includes:

- 1. Meters will be repaired or replaced within 10 days when malfunctions occur.
- 2. Meters will be inspected annually and maintained using manufacturer recommendations.
- 3. Meters will be tested on-site for accuracy at least once every five years. Each meter will be repaired or replaced if its test measurements are not within six percent.
- 4. Meter repair or replacement will be reported to DWR or the GMD within 30 days.
- 5. Owners need to notify DWR as soon as their meter is removed to avoid any enforcement conflicts.

If a meter is already installed, the irrigator will provide the most recent date that the meter was tested for accuracy and the results of the test. Finally, the irrigator will identify the frequency with which the meters will be read during the irrigation season.

Irrigation Scheduling

Irrigation scheduling is the determination of when and how much water needs to be applied to a crop to maintain healthy growth. ET-based scheduling uses real-time crop and weather data to calculate daily crop rate use. Daily water use values, combined with soil root zone information, can be used to develop an irrigation schedule that tracks soil water levels. These values determine when irrigation should be added to maintain acceptable soil water levels. ET-based irrigation scheduling may be required; soil-based irrigation scheduling may also be an option (through the use of a tensiometer, gypsum block or electrical resistance blocks, soil probe, or feel and appearance method). Other items in this subsection include the frequency of soil moisture measurement, and whether the irrigator will use a consultant for scheduling.

Sprinkler System

Provide irrigation application depth in inches. For non-center pivot systems, provide the acres per zone or set and the typical set time. Center pivot systems require the number of days to complete the circle.

Flood System

Provide irrigation application depth in inches; acres per zone or set; typical set time in hours; and a description of the application method. Example application methods include alternate furrow irrigation; compacted furrows; inter-furrow ripping; and polyacrylamides.

Drip System

Provide irrigation application depth in inches; acres per zone or set and typical set time in hours.

Cultural and Tillage Practices

Provide the planned residual level (in pounds per acre) and a description of the cultural and tillage practices to be used. Example practices include stubble mulch; minimum tillage; no tillage; ridge tillage; skip row planting; and plant growth inhibitors.

Crops and Operations Plan

Provide the crop type(s) and number of acres to be irrigated; and indicate when water will be applied; and the number of applications. Examples include crop stress; soil moisture; projected monthly water use; and number of applications. In addition: provide a water budget (authorized quantity remaining); identify whether it will be a full or limited irrigation practice; and complete a water management summary.

Agreement Section

This Section of the plan contains the irrigator's signed agreement to implement the water conservation plan. The type of agreement required is dependent upon the reason for developing a water conservation plan, and in the case of the NRCS, could be in the form of a contract.

APPENDIX A

Example Irrigation Water Conservation Plan				
Introduction				
Date	May 27, 2006			
Producer Information				
Name	John Doe, Jr			
Address	RR 8, Box 99, Oberlin, KS 67749			
Telephone Number				
E-mail Address				
Owner Information				
Name	John Doe, Sr			
Address	908E Pearl Ave, Oberlin KS 67749			
Telephone Number	785-555-5555			
E-mail Address				
Plan Purpose				
Description of proposed use, changes and why plan is be-	This plan is required to ensure that I will irrigate within			
ing completed.	my annual authorized quantity.			
	my annual authorized quantity.			
Water Right Information	File No. DC000000 (2 wells)			
Water Right File Number	File No. DC000099 (2 wells)			
County of Point of Diversion	Decatur (ID 04)			
Legal Description of Point of Diversion	NE NE SE 33-1-27W (ID 01) NW SW SE in 33-1-27W (ID 02)			
Source (ground or surface water)	Ground			
Authorized Quantity (af)	ID 01 has 28 af; ID 02 has 57 af			
Authorized Rate of Diversion (gpm)	ID 01 = 340 gpm; ID 02 = 360 gpm			
Acres Authorized to be Irrigated (ac)	125 ac			
Place of Use (general legal description)	9 acres in SW 1/4 & 116 acres in SE 1/4 of 33-1-27W			
Syst	em			
Meter Information				
Date of Installation	5/4/2004 (both)			
Manufacturer	McCrometer (both)			
Model Number	MD 304 (both)			
Serial Number	04-4-XXX1 on ID 01; 04-4-XXX2 on ID 02			
Meter Type	bolt on saddle propeller meter (both)			
Meter Size (inches)	8			
Units of Measurement	AF			
Multiplier	.001			
Location	at well (both)			
Inside Diameter of Pipe (in.)	7.806			
Field Information				
Soil Type	Bridgeport silt loam			
Design Slope (%)	2.00%			
Soil/Slope Worksheet	Attachment A			
General Layout Map	Attachment B			
	1			

Source and Conveyance			
Well / Pumpsite Evaluation	This system is composed of 2 wells with a total appropriation of 85 acre feet and a total capacity to pump 700 gpm. We grow alfalfa under a hand moved sprinkler system and use gated pipe to flood about 26 acres		
Conveyance System	buried pipe; ditch		
Irrigation System Information			
Sprinkler System			
System Type	hand moved sprinkler pipe		
Manufacturer	Rain Bird		
System Length (ft)	1320 ft		
Design Discharge Rate (gpm)	300 gpm		
Design Pressure (psi)	60 psi		
Pressure Regulators (if installed, report psi)	none		
Nozzle Package Type	impact		
Nozzle Height from Ground (ft)	2 ft		
Nozzle Spacing (ft)	30 ft		
Maximum Wetted Diameter (ft)) 60 ft		
Acres in Field	30		
Flood System			
Type of System	Flood (furrows), using gated pipe		
Run Length (ft)	1060 ft		
Design Discharge Rate (gpm)	400 gpm		
Acres in Field	26		
Describe Tailwater Recovery System	Berm end of field to control tailwater; no recovery system		
Surge Valves	none		
Management			
Metering			
All points of diversion covered under this plan will have meter	ers installed and maintained in compliance with DWR an		

All points of diversion covered under this plan will have meters installed and maintained in compliance with DWR and applicable GMD regulations.

Meters will be repaired or replaced within 10 days when malfunctions occur (provide notice to DWR if malfunctioning).

Meters will be inspected annually and maintained using manufacturer recommendations.

Meters will be tested on-site for accuracy at least once every **five** years. Each meter will be repaired or replaced if its test measurements are not within **six** percent.

Owners need to notify DWR as soon as their meter is removed to avoid any enforcement conflicts.

e where need to hearly Birit do even de aren meter le remerce to aveid any emercement commete.				
Date of most recent meter test	5/24/04			
Meter test results	Inspected and tested by DWR staff from Stockton KS			
During the irrigation season, all meters will be read:	Every 1 to 3 days, recording: 1) Date and time of reading; 2) amount of water pumped since last reading; 3) total amount of water pumped during current year; 4) compare total pumped and authorized quantity remaining; record monthly and report to DWR.			
Meter repair or replacement will be reported within 30 days to:	DWR Stockton Field Office			

Irrigation Scheduling				
Soil-Based Irrigation Scheduling	Soil probe.			
Frequency of Soil Moisture Measurement	Determination will be made at different stages of plan growth.			
Use Consulting Firm for Scheduling	Crop consultants will be monitoring moisture needs and insect pressure on a regular basis.			
Sprinkler System				
Irrigation Application Depth (in)	2.2 in			
Acres per Zone or Set (ac)	1.8 acres			
Typical Set Time (hr)	6 hrs			
Flood System				
Irrigation Application Depth (in)	4.1			
Acres per Zone or Set (ac)	2.6			
Typical Set Time (hr)	12			
Describe application method	furrow irrigate every row			
Cultural and Tillage Practices				
Planned Residue Level	4,000 lbs/acre on sprinkler			
Describe cultural and tillage practices	Less intensive crops grown (triticale)			
Crops and Operations Plan				
Provide number of acres, type of crop, when water will be applied and number of applications	We will irrigate when the available soil moisture falls below 50% in the top 2 feet of the soil profile.			
Water Budget (Authorized Quantity Remaining)	4 irrigations on alfalfa (sprinkler) and 2 on triticale (flood field).			
Full or Limited Irrigation Practice	limited			
Water Management Summary	Attachment C: Decatur County Net Irrigation Requirements			

Consent Agreement

Enhanced Water Management Agreement

The landowner or his/her agent will:

- 1. Provide information on irrigation demand which must include the following: the monthly crop water requirement for the proposed crop in the county where the place of use is located, and a proposed monthly water application budget which will best meet the crop demand within the annual authorized quantity under this right;
- 2. Install a water flow meter in accordance with the provisions of K.A.R. 5-1-4 through K.A.R. 5-1-10.
- 3. Provide notice in writing to the Division of Water Resources prior to making any actual diversion of water for the authorized purpose.

Such notice shall include a statement that the Water Conservation Plan has been implemented, the meter installed and the diversion works are ready to be inspected.

Such notice shall also include a time and date prior to any diversion of water for the authorized use when the diversion works may be operated for the purpose of testing the accuracy of the installed flow meter.

- 4. Provide access to the diversion works authorized under the above referenced water right, at such time as the Division of Water Resources or their designated representative has need to inspect the diversion works for the purpose of determining compliance.
- 5. Provide a report of water use by the 5th day after the end of any month in which water was diverted under the above referenced water right.

Such report shall set forth the following: the beginning and ending meter readings, the quantity of water diverted within that month, the total quantity used in this calendar year under the above referenced water right, and the remaining authorized quantity.

Any other conditions:

I declare that I am a landowner as identified herein, or that I represent all landowners as identified herein and am authorized to sign this document on his or her behalf, and declare further that the statements contained herein are true, correct and complete. Further, I understand that this plan will become a condition of this right and that any violation subjects the owner to such enforcement actions as may be appropriate under the Kansas Water Appropriation Act. Which may include revocation of the water right. I understand my quantity as authorized under this right is 85 acre feet. Exceeding this quantity is a violation. This plan remains in force until a review of the plan pursuant to K.A.R. 5-3-5(k) constitutes a modification ordered by the Chief Engineer.

Name:
State of Kansas) County of Decatur)
I do hereby certify that <u>John Doe, Jr</u> appeared before me and signed this foregoing application in my presence this 27th day of May 2006.
Notary Public: My commission expires: 9-27-06

John Doe, Jr

File No. DC000099

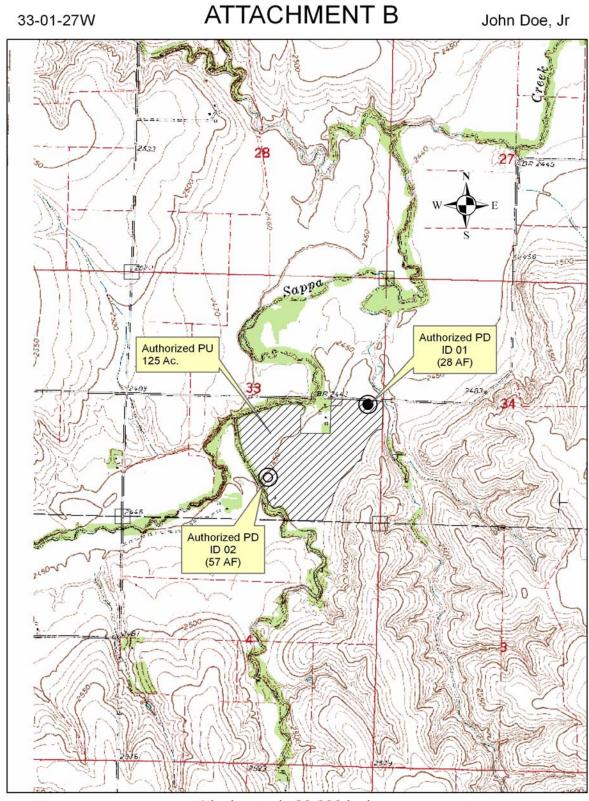
ATTACHMENT A

Soil/Slope Worksheet

Please complete the following information for the description of the operation for the irrigation project.

a. Indicate the soils in the field(s) and their intake rates:

Soil Name	Percent of Field (%)	Intake Rate (in/hr)	Irrigation Design Group
Bridgeport silt loam	100	.5	5
Total:	100%		
b. Estimate the average land slope in the field(s):		2.0	%
c. Estimate the maximum land slope in t	he field(s):	2.0	%



1 inch equals 20,000 inches

John Doe, Jr

File No. DC000099

ATTACHMENT C

Decatur	County
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Net Irrigation Requirements (Inches)

For Rainfall 5 Years Out of 10 (50% Chance – Normal Years)

	Сгор						
Month	Alfalfa	Corn	Sor- ghum	Grass	Wheat	Soy- beans	Sugar Beets
March					1.13		
April	1.15				2.70		
May	2.19	.19			3.31		
June	3.63	2.73	.11				
July	5.08	5.47	4.67			2.12	
August	4.51	4.31	4.38			5.73	
Septem- ber	2.69		1.55			2.56	
October	1.25				.61		
November					.96		
Total*	20.5	12.7	10.7		8.70	9.80	

John Doe, Jr

File No. DC000099

APPENDIX B

DEFINITIONS OF SELECTED WATER USE EFFICENCY PRACTICES AND OTHER TERMS

Alternate furrow irrigation: Introduction of irrigation water into every other furrow between rows of a planted crop. Irrigation can remain in the same furrow, or furrows can be switched on subsequent irrigation. Alternate furrow irrigation can improve irrigation efficiency.

Available soil water: See available water capacity.

Available water capacity (AWC): The portion of soil water that can be readily absorbed by plant roots of most crops, expressed in mm water per mm soil (inches per inch, inches per foot, or total inches) for a specific soil depth. It is the amount of water stored in the soil between field capacity (FC) and permanent wilting point (WP). It is typically adjusted for salinity (electrical conductivity) and rock fragment content. It is also called available water holding capacity (AWHC), or available soil water.

Bench terracing: A series of earthen embankments spaced across the downhill slope of a field to contain runoff from the field and designed to spread water from natural slopes over leveled field areas behind the terraces.

Blatant and Recurring Overpumping Program: Program administered by KDA/DWR to obtain compliance on water right holders that pump in excess of their authorized quantities in a blatant and recurring manner.

Boom sprinkler: An elevated, cantilevered sprinkler mounted on a central stand. The sprinkler boom rotates about a central pivot.

Border irrigation: Irrigation by flooding strips of land, rectangular in shape and cross leveled, bordered by dikes. Water is applied at a rate sufficient to move it down the strip in a uniform sheet. Border strips having no downfield slope are referred to as level border systems. Border systems constructed on terraced lands are commonly referred to as benched borders.

Center pivot irrigation system: A sprinkler irrigation lateral that is mounted on wheeled structures (towers), anchored at one end (pivot point), and which automatically rotates in a circle when irrigating. The lateral can be equipped with any of a variety of sprinkler and spray nozzle configurations. Tower movement can be driven by water pressure, hydraulic pressure, or electricity. A typical center pivot has one-quarter mile radius.

Corner pivot sprinkler: An additional span or other equipment attached to the end of a center pivot irrigation system that allows the overall radius to increase or decrease in relation to the field boundaries.

Compacted furrows: Soil compaction in furrow from tractor wheels or compacting implement attachments that smooth and firm furrows resulting in increased water stream advance rates, reduced infiltration, and improved irrigation application efficiency for furrow irrigation.

Conservation tillage: A tillage practice that leaves plant residues on the soil surface for erosion control and moisture conservation. This is sometimes defined as tillage that leaves at least 30% residue cover on the surface after the planting operation.

Conventional tillage: The traditional tillage practice that involves inverting the tillage layer, burying most of the plant residues, and leaving the soil relatively bare.

Crop stress: Conditions that limit a plant's ability for growth and development. Soil water availability, temperature and other weather factors, disease, insects, and other exposures can cause various crop stresses.

Deficit irrigation: An irrigation water management alternative where the soil in the plant root zone is not refilled to field capacity in all or part of the field.

Drip irrigation system: A method of irrigation in which water is allowed to drip or trickle from perforations in a low pressure pipe (usually plastic and double-walled) placed alongside the base of a row of plants. The spacing of the perforations is designed to produce a wetted strip along the crop row or a wetted area at the base of each plant.

Drop tubes or nozzles: Flexible or rigid hoses or pipe that lower the discharge point of a nozzle below the main lateral of a center pivot to distribute water usually at low pressure between crop rows in order to reduce evaporation.

Electrical resistance block: Small block consisting of electrodes set in an absorbent material, such as gypsum, used to estimate soil water content.

Enhanced water management: Technical assistance to provide better water management practices.

Evapotranspiration: The combination of water transpired from vegetation and evaporated from the soil and plant surfaces.

Feel and appearance method: A method to estimate soil water by observation and by feeling soil samples with the hand and fingers.

Flood Irrigation: Surface irrigation methods in which water is distributed over the soil surface by gravity flow. Types of flood irrigation include furrow, gated pipe, surge, border, and wild flooding.

Flow meter: An instrument used to measure the volume and/or rate of flow of water in a conduit or channel.

Full irrigation: Management of a water application to fully replace the soil water deficiency over an entire field.

Furrow irrigation: Method of surface irrigation where the water is supplied to small ditches or furrows for guiding across the field.

Furrow diking: Installation of mounds of soil (dikes) in a furrow or installation of small depressions in the furrow to retain precipitation or irrigation water for crop use.

Gated pipe flood system: Portable pipe with small gates installed along one side for distributing irrigation water to corrugations or furrows.

Gypsum block: See electrical resistance block.

Hand move sprinkler: See portable sprinkler.

Infrared canopy monitor: A sensor used to determine plant stress by measuring crop canopy temperatures.

Inter-furrow ripping: a method of deep tilling in furrows using a chisel. The purpose is to break up the soil to allow better infiltration of water.

Irrigation scheduling: Procedure used in determining when to irrigate and how much water to apply to meet specific management objectives. There are several methods used to determine water needs, including (1) water balance method, (2) stress-day index, (3) optimal sequencing of evapotranspiration deficits, and (4) measurement of leaf temperatures.

Irrigation system: The physical components and configuration used to apply water by irrigation; may include pumps, pipelines, valves, nozzles, ditches, gates, siphon tubes, turnout structures, land shaping, furrows etc.

Lateral (or linear) move sprinkler system: An automated irrigation machine consisting of a sprinkler line supported by a number of self-propelled towers. The entire unit moves in a generally straight path and irrigates a basically rectangular area.

Limited irrigation: Management of irrigation applications to apply less than enough water to satisfy the soil water deficiency in the entire root zone; sometimes called "deficit" or "stress irrigation." Plant water deficits are allowed to occur generally on crops that are drought tolerant or with stages of growth that are less sensitive to water deficits. One example is fully irrigating only the upper half of a field. The next 25 percent is the tailwater runoff section that receives limited irrigation, and the lower one-fourth is dryland which may receive runoff from the upstream sections.

Low energy precision application (LEPA): Center pivot irrigation system that distributes water from an overhead lateral pipeline directly in furrows at very low pressure through drop tubes and orifice-controlled emitters. The purpose of this system is to apply water directly onto or near the soil to improve irrigation efficiency for systems with limited irrigation capacity.

Minimum tillage: Agricultural practices that minimize soil water loss; retain crop residuals to minimize soil erosion; and reduce tillage energy and labor requirements.

Net irrigation: The actual amount of applied irrigation water stored in the soil for plant use or moved through the soil for leaching salts. Also includes water applied for crop quality and temperature modification, i.e., frost control, cooling plant foliage and fruit. Application losses, such as evaporation, runoff and deep percolation are not included. Generally measured in mm (inches) of water depth applied.

Net irrigation water requirement: The depth of water, exclusive of effective precipitation, stored soil moisture, or ground water, that is required for meeting crop evapotranspiration for crop production and other related uses. Such uses may include water required for leaching, frost protection, cooling and chemigation.

No tillage (no-till): Farming practice in which the soil is not tilled as a means of reducing soil water loss and soil erosion. A tillage system in which the soil is not tilled except during planting when a small slit is made in the soil for seed and agrochemical placement. Pest control is achieved through the use of pesticides, crop rotation, and biological control rather than tillage. Sometimes called "zero tillage."

Nozzle: Discharge opening or orifice of sprinkler head used to control the volume of discharge, distribution pattern, and droplet size.

Plant growth inhibitors: Chemicals used to alter plant growth characteristics.

Playa: A depression in the soil surface without an outlet for runoff. It is covered with relatively impervious surface layers that inhibit water infiltration. A Playa can be used to store runoff water for irrigation purposes.

Permanent Sprinkler: A system of underground piping with risers and sprinklers.

Polyacrylamides (PAM): An organic polymer added to irrigation water in surface irrigation systems to reduce furrow sediment detachment and flocculate suspended sediments with the resultant effect of reducing furrow erosion.

Portable (hand move) sprinkler: A sprinkler system which is moved by uncoupling and picking up the pipes manually, requiring no special tools.

Reduced tillage: Any system of tillage that leaves plant residues on the soil surface (see conservation tillage).

Ridge tillage: Agricultural practices of permanent ridge formation by tillage implements on which crops are grown. The purpose of ridge tillage is to maximize moisture retention while minimizing soil erosion.

Root zone: Depth of soil that plant roots readily penetrate and in which the predominant root activity occurs.

Side-move sprinkler: A sprinkler system with the supply pipe supported on carriages and towing small diameter trailing pipelines, each fitted with several sprinkler heads.

Side-roll sprinkler: The supply pipe is usually mounted on wheels with the pipe as the axle and where the system is moved across the field by rotating the pipeline by engine power.

Skip row planting: One or more unplanted strips remain between planted rows in order to reduce crop water requirements.

Soil moisture or soil water: All water stored in the soil (see water holding capacity).

Soil probe: Slotted tube used to extract a column of soil from a soil profile.

Solid set sprinkler: System which covers the complete field with pipes and sprinklers in such a manner that all of the field can be irrigated without moving any of the system.

Sprinkler irrigation: Method of irrigation in which the water is sprayed, or sprinkled, through the air to the ground surface. Sprinkler irrigation systems include boom, center pivot, corner pivot, lateral move, permanent, portable (hand moved), side-move, side-roll, solid set, and towed sprinklers.

Stubble mulch: Residue left on the surface in order to control erosion and increase precipitation storage.

Subsurface drip irrigation (SDI): Application of water below the soil surface through emitters, with discharge rates generally in the same range as drip irrigation. This method of water application is different from and not to be confused with subirrigation where the root zone is irrigated by water table control.

Surface Irrigation: See flood irrigation.

Surge flow irrigation: The intermittent application of irrigation water to irrigation pathways, creating a series of on and off periods of constant or variable duration in an attempt to improve irrigation efficiency. A microprocessor control unit temporarily opens and closes valves in gated pipe in order to discharge water in surges that achieve relatively even watering along entire length of row.

Tailwater recovery system: System to collect, store and reuse irrigation and surface runoff. Water is collected in a tailwater pit where it can be stored and used to irrigate crops.

Tensiometer: Instrument, consisting of a porous cup filled with water and connected to a manometer or vacuum gauge, used for measuring the soil-water matric potential.

Terrace: A broad channel, bench, or embankment constructed across the slope to intercept runoff and detain or channel it to protected outlets.

Totalizer: The mechanical or electronic portion of the register that displays the total quantity of water that has passed the water flowmeter sensor.

Towed sprinkler: System where lateral lines are mounted on wheels, sleds, or skids, and are pulled or towed in a direction approximately parallel to the lateral.

Trickle irrigation: See drip irrigation.

Water budget: The inflows and outflows of water in a system. For irrigated crop production within the crop rooting zone, major water inflows include precipitation and irrigation; outflows include crop water use, soil evaporation, and deep percolation. The change in soil water content within the root zone can be either positive or negative.

Water holding capacity: Total amount of water held in a freely drained soil per increment of depth. It is the amount of water held between field capacity and oven dry moisture level, expressed in cm/cm (in/in), cm/m (in/ft), or total centimeters (in) for a specific soil depth. It is sometimes called total water hold capacity (see available water capacity).

Water meter: See flow meter.

Wild flooding: A surface irrigation system where water is applied to the soil surface without such flow controls as furrows, borders (including dikes) or corrugations.